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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :
A23L 3/3526, 3/3508, A21D 2/24, 2/14, 8/02

A1

(11) International Publication Number: WO 96/39877

(43) International Publication Date: 19 December 1996 (19.12.96)

(21) International Application Number: PCT/US96/09783

(22) International Filing Date: 7 June 1996 (07.06.96)

(30) Priority Data:
08/482,772 7 June 1995 (07.06.95) US

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(81) Designated States: AM, AU, BB, BG, BR, BY, CA, CN, CZ, EE, FI, GE, HU, IS, JP, KG, KP, KR, KZ, LK, LR, LT, LV, MD, MG, MN, MX, NO, NZ, PL, RO, RU, SG, SI, SK, TJ, TM, TT, UA, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published

With international search report.

Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: NOVEL MOLD INHIBITORS AND METHOS OF MAKING AND USING THE SAME

(57) Abstract

The invention is novel mold growth inhibiting products for various food stuffs, and a method of making and using the same. The mold growth inhibiting product is generally a mixture of various compounds, including: a first compound which is generally azodicarbonamide, a second compound which is generally lactic acid, fumaric acid, potassium sorbate, sodium sorbate, calcium sorbate, sorbic acid, salts of sorbic acid, calcium propionate, potassium propionate, sodium propionate, propionic acid, salts of propionic acid or mixtures thereof. In a second embodiment of the invention, a third compound is added which lowers the decomposition temperature of the azodicarbonamide. The third embodiment of the invention is a liquid mixture of the above described dry mixtures and water. All embodiments of this invention are added to the food stuff in the same or greater percentages of current day mold inhibitors, yet the resultant food stuff has no off flavor, taste or color which is normally imparted by current day mold inhibitors. Additionally, the food stuffs incorporating the mold inhibiting products of this invention have increased shelf lives as the mold inhibiting products are more effective than current day mold inhibitors. The mold inhibiting products of this invention effectively inhibit mold growth in food stuffs such as corn and wheat tortillas, cream cheese, bagels, fruit fillings, and other baked goods, dairy products and, processed fruit and meat products.

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NOVEL MOLD INHIBITORS AND METHODS OF MAKING AND USING THE SAME

This is a continuation-in-part application of Serial No. 08/363,716 entitled "Novel Mold Inhibitors and Methods of Making and Using the Same" filed December 23, 1994, which was a continuation-in-part application of Serial No. 08/099,939 entitled "Mold Inhibitory Compounds for Wheat Flour Products," filed July 30, 1993, which are both incorporated herein by reference.

Field of the Invention

This invention relates to novel mold growth inhibiting products for food stuffs, i.e. food preservatives generally. More particularly, this invention relates to novel compounds for inhibiting the growth of molds over a commercially reasonable time period in various food products, while eliminating the off flavor, off color and/or odor which other known food preservatives impart.

Background of the Invention

The growth of mold is a significant problem in packaged or processed foods such as dairy products, baked goods, fruit and vegetable containing products such as fruit fillings for pies or pastries, and processed meats. The growth of mold not only significantly reduces the useful shelf life of the product, thus increasing the sellers direct costs due to stale or moldy product which can not be sold; but also requires that certain items are refrigerated during shipping and/or at the market place which causes additional indirect expenses for the end seller of the product.

Various food preservatives are on the market, yet when used at concentrations which effectively increase shelf life, the prior art food preservatives impart an off flavor, odor, color and/or texture to the product which is undesirable. Consequently, a need exists for a food preservative that increases the shelf life of the product while not requiring refrigeration or causing off flavor, color, odor and/or texture.

PRIOR ART

Calcium propionate and potassium sorbate are recognized mold inhibitors. For example, U.S. Patent Nos. 3,900,570 and 4,416,904 both disclose the use of calcium propionate and potassium sorbate at very low concentrations as optional mold inhibitors. For example, U.S. Patent No. 3,900,570 discloses a maximum usage of calcium propionate of 0.25 parts by weight per 100 parts of flour in the finished dough, with the preferred being about 0.06 to about 0.12. Similar concentrations are disclosed in U.S. Patent No. 4,416,904. Contrarily, the novel compound of this invention may also be used at about the same ranges but also up to 5.0 percent by total weight of ingredients used to prepare the food stuff with the optimum percentage depending on the food product and the desired shelf life.

The low concentrations of mold inhibitors used in prior art products are necessary due to the off flavor, odor, taste and/or texture that is imparted by the propionate or sorbate when concentration levels are increased. To date, no one has effectively prepared a food preservative which incorporates either a propionate or sorbate such that when used at increased levels does not impart an undesirable off flavor, odor, or texture.

Refrigeration has also been used to inhibit mold growth. However, for many food items, refrigeration is not available or is impractical due to limited space and excessive cost.

Consequently, a need exists for a product which inhibits the growth of mold and thus extends the shelf life of a food stuff containing the mold inhibiting product, while not imparting an off flavor, either bitter or acidic, off odor and/or texture. It is even more desirable that increased mold inhibition without adverse side effects be accomplished without the need for refrigeration. Additionally the mold growth inhibiting product should use relatively inexpensive and available ingredients in such quantities as to be commercially economical.

Summary of the Invention

The present invention provides novel compounds, and methods of making and using the same, for inhibiting the growth of molds in dairy products such as cream cheese, whipped cream, and shredded cheese; baked goods such as bagels, pound cake and pastries; fried goods such as corn and wheat tortillas; fruit containing products such as fruit fillings for pies and pastries; and processed meats.

All embodiments of the novel compound include the first compound which is either azodicarbonamide or potassium bromate, preferably azodicarbonamide.

In the first embodiment, the second compound is potassium sorbate, sodium sorbate, calcium sorbate, sorbic acid, salts of sorbic acid, calcium propionate, potassium propionate, sodium propionate, propionic acid, salts of propionic acid, citric acid, lactic acid, fumaric acid or mixtures thereof.

In the second embodiment, a third compound which lowers the decomposition temperature of azodicarbonamide is utilized and the second compound is lactic acid, fumaric acid, potassium sorbate, sodium sorbate, calcium sorbate, sorbic acid, salts of sorbic acid, calcium propionate, potassium propionate, sodium propionate, propionic acid, salts of propionic acid, or mixtures thereof.

In either the first or second embodiment, the novel mold growth inhibiting product is ultimately a dry powder mixture. The manner in which either embodiment is added to the food product is dependant on the temperature at which the food product will be processed.

In conjunction with the first embodiment, if the food products will be baked or processed at temperatures of about 212°F or above, the compound is added directly to the raw ingredients used to prepare the final product. If the processing temperature is below about 212°F, the dry mixture is initially added to water in a ratio of about 0.25 lb of mold inhibiting product to every 3 ounces of water and then heated to a temperature of about 212°F to about 475°F, preferably about 400°F, for a sufficient time, about 20 to about 30 minutes, preferably 25 minutes. The resultant product is ground to about the same fineness as the azodicarbonamide before processing, about 3 μm, and then added to the other ingredients of the food product at about 0.01 to about 20.0 percent by total weight of the raw ingredients for the food stuff.

In conjunction with the second embodiment which contains the third compound, if the food stuffs will be baked or processed at temperatures of above about 140°F, the mold growth inhibiting product is added directly to the raw ingredients of the food stuff. If the processing temperature is below this range, the dry mixture of the second embodiment is added to water in a ratio of about .25 lb mold growth inhibiting product to every 3 ounces of water and then heated

to a temperature of about 140°F to about 475°F, preferably about 212°F to 365°F, for a sufficient time, about 6 to about 10 minutes, preferably about 8 minutes. The resultant product is ground to about the same fineness as the azodicarbonamide before processing, about 3 μm, and then added to the raw ingredients of the food stuff at about 0.5 to about 5.0 percent by total weight of raw ingredients.

The third embodiment of this invention is a liquid mixture of water and a dry mixture of azodicarbonamide as the first compound, and lactic acid, citric acid, fumaric acid, potassium sorbate, sodium sorbate, calcium sorbate, sorbic acid, salts of sorbic acid, calcium propionate, potassium propionate, sodium propionate, propionic acid, salts of propionic acid, or mixtures thereof as the second compound. The ratio of water to dry mixture is about 4:1 to about 8:1 by weight percent.

The fourth embodiment of this invention is a liquid mixture of water and a dry mixture of azodicarbonamide as the first compound, lactic acid, fumaric acid, potassium sorbate, sodium sorbate, calcium sorbate, sorbic acid, salts of sorbic acid, calcium propionate, potassium propionate, sodium propionate, propionic acid, salts of propionic acid, or mixtures thereof as the second compound, and a third compound which lowers the decomposition temperature of azodicarbonamide. The ratio of water to dry mixture is about 4:1 to about 8:1 by weight percent.

In both the third and fourth embodiments, after the water is added to the dry mixture, the combination is boiled for about 15 minutes and then let cool. After cooling, additional water is added to replace the amount of liquid lost during the boiling stage. The liquid mold growth inhibiting product is added to the food stuff at a rate of about 0.01 to about 20.0 percent by total weight of raw ingredients of the food stuff.

Although not wanting to be bound by one theory, it is believed by heating the mold growth inhibiting products of this invention, either during processing or before the mold growth inhibiting product is added to the raw materials of the food stuff, enables the azodicarbonamide to eliminate the off flavor, odor and texture normally imparted by current day mold growth inhibitors such as sorbates or propionates.

Brief Description of the Drawings

Figure 1 is a Summary of Mozzarella Manufacturing.

Figure 2 is a Summary of Cheddar Manufacturing.

Figure 3 is a Summary of Yeast and Mold Growth on Cheeses at 25C (76F).

Figure 4 is a Summary of Yeast and Mold Growth on Cheeses at 4C (40F).

Figure 5 is a Summary of Chemical Data 48 Hours Post Manufacture.

Figure 6 is a Summary of Microbial Data 48 Hours Post Manufacture.

Detailed Description of the Invention

As required, a detailed embodiment of the present invention is disclosed herein. It is, however, to be understood that the disclosed embodiment is merely illustrative of the invention, which may be embodied in various forms. Therefore, specific structural and functional details disclosed herein are not to be interpreted as limiting, but merely as a basis for the claims and as a representative basis for teaching one skilled in the art to employ the mold inhibitory compound in the appropriate products.

In accordance with the present invention, a mold growth inhibiting product is provided for wheat or corn based bakery products, dairy products, fruit containing products such as pie or pastry fillings, and processed meats.

The first embodiment of the mold growth inhibiting product is a dry powder mixture comprised of a first compound which is azodicarbonamide or potassium bromate, preferably azodicarbonamide, and a second compound which is citric acid, lactic acid, fumaric acid, potassium sorbate, sodium sorbate, calcium sorbate, sorbic acid, salts of sorbic acid, calcium propionate, potassium propionate, sodium propionate, propionic acid, salts of propionic acid or mixtures thereof, preferably calcium propionate, sodium propionate, potassium sorbate or mixtures thereof.

In reference by total weight of the mold growth inhibiting product, in the first embodiment, the first compound is present in the amount of about 0.001 to about 5.0 percent by weight, preferably about 0.001 to about 0.01; and the second compound is present in the amount of about 99.999 to about 95.0 percent by weight, preferably 99.999 to about 99.99.

Azodicarbonamide is an organic salt normally used as a dough conditioner or oxidizing agent in the food industry. It is also used as a blowing agent in the rubber industry. Azodicarbonamide is normally used in baked goods to reduce the stickiness of the dough which in turn makes processing easier. To date, it has not been used or approved as an ingredient for mold inhibiting products. In fact, FDA approval has only issued for using azodicarbonamide as a maturing or oxidizing agent. Consequently, the inventor is currently acquiring FDA approval for the use of azodicarbonamide in conjunction with mold growth inhibitors.

Azodicarbonamide is commercially available under the trademark "AZ-130", from the Sherex Chemical Company of New York as well as other sources. The other compounds are also commercially available from several different sources.

If the first embodiment will be added to food stuffs which are exposed to temperatures above about 212°F during processing, the first embodiment is added directly to the raw ingredients of the food stuff at about 0.01 to about 20.0 percent by total weight of raw ingredients, preferably about 0.5 to about 5.0 percent.

If the food stuff will not be exposed to temperatures of above about 212°F, the first embodiment is added to water in a ratio of about 0.25 lb of first embodiment to every 3 ounces of water and then heated to a temperature of about 212°F to about 475°F, preferably about 400°F, for a sufficient time, about 20 to about 30 minutes, preferably 25 minutes. The resultant product is ground to about the same fineness as the azodicarbonamide before processing, about 3 μm, and then added to the raw ingredients of the food product at about 0.01 to about 20.0 percent by total weight of raw ingredients used to produce the food stuff.

The second embodiment comprises the first compound as discussed in reference to the first embodiment, lactic acid, fumaric acid, potassium sorbate, sodium sorbate, calcium sorbate, sorbic acid, salts of sorbic acid, calcium propionate, potassium propionate, sodium propionate, propionic acid, salts of propionic acid or mixtures thereof, preferably calcium propionate, sodium propionate, potassium sorbate or mixtures thereof as the second compound, and a third compound which reduces the decomposition temperature of azodicarbonamide. The third compound is a metal oxide such as zinc oxide, a metal salt, a organometallic complex such as barium, zinc, or calcium stearate, or other compounds such as citric acid, triethanol amine, or calcium sulfate, the preferred being citric acid or zinc oxide.

In reference by weight of mold growth inhibiting product, in the second embodiment, the first compound is present in the amount of

about 0.001 to about 5.0 percent by weight, preferably about 0.001 to about 0.01; the second compound is present in the amount of about 99.995 to about 70.0 percent by weight, preferably 99.995 to about 98.59; the compound is present in the amount of about 0.004 to about 30.0 percent by weight, preferably 0.004 to about 1.4.

Again, whether initial processing of the second embodiment of the mold inhibitory compound is required will be dependant on the temperature at which the food stuff is processed.

If the food stuff will be processed at temperatures above about 140°F, the second embodiment of the mold growth inhibiting product is added directly to the raw ingredients of the food stuff. If the processing temperature is below this range, the second embodiment is added to water in a ratio of about 0.25 lb of the second embodiment to every 3 ounces of water and then heated to a temperature of about 140°F to about 475°F, preferably about 212°F to about 365°F, for a sufficient time, about 6 to about 10 minutes, preferably about 8 minutes. The resultant product is ground to about the same fineness as the azodicarbonamide before processing, about 3 μm, and then added to the other raw ingredients of the food stuff at about 0.01 to about 20.0 percent, preferably about 0.5 to about 5.0 percent by total weight of the raw ingredients used to prepare the food stuff.

The third embodiment of the novel mold growth inhibiting product of this invention is comprised of about 1 part by weight of dry mixture to about 4 to 8 parts by weight of water. For example, 100 g of dry mixture would be mixed with about 400 to about 800 grams of water, preferably about 600 grams. The dry mixture is comprised of a first compound as discussed above in reference to the first embodiment, and a second compound which is citric acid, lactic acid, fumaric acid, potassium sorbate, sodium sorbate, calcium sorbate, sorbic acid, salts of sorbic acid, calcium propionate, potassium

propionate, sodium propionate, propionic acid, salts of propionic acid or mixtures thereof, preferably calcium propionate, sodium propionate, potassium sorbate or mixtures thereof.

In reference by weight of mold growth inhibiting product, in the third embodiment, the first compound is present in the amount of about 0.001 to about 5.0 percent by weight, preferably about 0.001 to about 0.01; the second compound is present in the amount of about 99.999 to about 95.0 percent by weight, preferably 99.999 to about 99.99.

The fourth embodiment of the novel mold growth inhibiting product of this invention is comprised of about 1 part by weight of dry mixture to about 4 to 8 parts by weight of water. For example, 100 g of dry mixture would be mixed with about 400 to about 800 grams of water, preferably about 600 grams. The dry mixture is comprised of a the first compound discussed above in reference to the first embodiment, a second compound which is lactic acid, fumaric acid, potassium sorbate, sodium sorbate, calcium sorbate, sorbic acid, salts of sorbic acid, calcium propionate, potassium propionate, sodium propionate, propionic acid, salts of propionic acid and mixtures thereof, preferably calcium propionate, sodium propionate, potassium sorbate or mixtures thereof, and a third compound which lowers the decomposition temperature of the first compound which was previously described above in relation to the second embodiment.

In reference by weight of mold growth inhibiting product, in the fourth embodiment, the first compound is present in the amount of about 0.001 to about 5.0 percent by weight, preferably about 0.001 to about 0.01; the second compound is present in the amount of about 99.995 to about 70.0 percent by weight, preferably 99.995 to about 98.59; the third compound is present in the amount of about 0.004 to about 30.0 percent by weight, preferably 0.004 to about 1.4.

The third and fourth embodiments are prepared by dissolving the dry mixture in the water to form a first product. The first product is then boiled for about 15 minutes to form a second product. The second product is allowed to cool and then filtered to remove any non-liquid residue. Additional water is then added to the filtered second product to replace the liquid lost during boiling.

The third and fourth embodiments are added directly to the raw materials of the food stuff or if the food stuff is a liquid in final form, the third embodiment may be added directly to the final food stuff. The third and fourth embodiments are added at about 0.01 to about 20.0 percent by weight of raw ingredients of final food stuff, preferably 0.5 to about 5.0 percent by weight.

All embodiments can be added directly to the raw ingredients for preparing the food stuff. For example, either the first or second embodiment can be incorporated into wheat flour dough by adding it to the flour. Either one of the four embodiments could be added to the moist dough, although the addition of the third and fourth embodiment may be less desirable as it adds additional water into the dough.

As an example of how to prepare tortillas comprising the mold growth inhibiting product of this invention, when making wheat tortillas, the preferred ratio is one percent (1%) of the mold growth inhibiting product of the first or second embodiment to the weight of the dry flour mix, although effective results have been obtained with a one half percent (½%) to one and one half percent (1½%).

Satisfactory results have been obtained utilizing the following formula for the mold growth inhibiting product of the first embodiment.

INGREDIENT	PERCENT BY WEIGHT
Azodicarbonamide	0.004%
Potassium Sorbate	49.998%
Calcium Propionate	49.998%

Table 1

These percentages are considered optimal for tortillas; however, differing percentages may be appropriate under other circumstances. For example, certain wheat flour mixtures may require smaller or greater percentages. The percentages provided are intended to be exemplary of a preferred composition.

The following examples are set forth to exemplify the invention and should not be used to limit the invention.

Example 1A

In tests conducted by the American Institute of Baking, a commercially produced tortilla flour was produced using 500 grams of QUAKER flour mix and 215 grams of water at 100° F. The water and flour mixture was mixed at two minutes at a low speed and for another two minutes at a higher, second speed with a dough hook. The dough was allowed to stand for five minutes and then divided into 50-gram balls which were heat pressed at 175° F. The raw tortillas were then baked on a griddle at 450° F for 30 seconds on each side with each side heated two times.

Tests were conducted under controlled conditions with certain flour tortillas identified as control specimens. Certain other specimens were prepared using 1.0 percent by weight of the mold growth inhibiting product of this invention and 99.0 percent by weight of flour mixture in accordance with the same procedure set forth above for the control specimens. Tortillas from each test batch were evaluated after baking for flavor, odor, eating quality, and mold.

The mold growth inhibiting product was comprised of the percentages set forth above in Table 1.

A first test batch of each set were heat sealed in cellophane bags, double-bagged in ziplock freezer pouches and stored at 25° C.

A second test batch of each set of tortillas were inoculated with mold colonies isolated from previously molded bakery products and then also stored at 25° C.

All test batches of tortilla samples were checked daily for visual signs of mold growth over a 21-day period.

By the end of the seventh day, visible signs of mold were present on the control wheat flour tortillas. However, the tortilla specimens containing the mold growth inhibiting product of this invention had not molded by the end of the 21-day test. Additionally, tortillas containing the disclosed mold inhibitory composition had no off flavor or undesirable texture at the 21-day period or at any time after baking. From the results of this test, The American Institute of Baking concluded that the disclosed mold growth inhibiting product is an effective mold inhibitor in the production of wheat flour tortillas.

Example 1B

Additional tests were run using the method of preparation disclosed in Example 1A. The tortillas (both the control batch and the batch containing the mold inhibitory compound) were subjected to 90° F for a period of 30 days. After such extreme conditions, the tortillas containing the mold growth inhibiting product of this invention still exhibited no mold growth, although under the extreme conditions the tortillas did have a stale taste.

Example 1C

Tests were also run comparing the tortillas prepared in accordance with the procedure outlined in Example 1A with tortillas containing 1.5 percent of a commercially available mold inhibitor. Both sets of tortillas did not mold after 21 days. However on day 1, the tortillas containing the commercially available mold inhibitor had a very acidic taste whereas the tortillas containing the mold growth inhibiting product of this invention had no acidic taste. Taste tests were run again at the 14 day mark. The tortillas containing the commercially available mold inhibitor had a bitter taste whereas the tortillas containing the mold growth inhibiting product of this invention had no acidic taste.

Example 2A

Tests were performed on corn tortillas manufactured with MASECA corn flour. One set included 0.7% by weight of sodium propionate as representative of a commercially available mold inhibitor. The other set included 1.0% of the mold growth inhibiting product of this invention as set forth in Table 1.

The tortillas were prepared similarly to the method disclosed in Example 1A. During the testing period, the humidity was maintained at 90% and the temperature was maintained at 115° F.

The dough and the tortillas of the test batch that contained the sodium propionate was off color with a light yellow appearance. No off color existed in the dough or the tortillas of the test batch containing the mold inhibitor of this invention. Other characteristics such as odor, flavor, and palatability were comparable.

The tortillas containing sodium propionate molded within 7 days. The tortillas containing the mold inhibitor as set forth in Table 1 molded in 13 days.

Example 2B

Tests were performed on corn tortillas manufactured with MASECA corn flour. One set included 0.7% by weight of sodium propionate as representative of a commercially available mold inhibitor. The other set included 1.0% of the mold growth inhibiting product of this invention encompassing the second embodiment. The mold inhibitor was comprised of 0.088% by weight of citric acid, 49.954% by weight calcium propionate, 49.954% by weight potassium sorbate, and .004% by weight of azodicarbonamide.

The tortillas were prepared similarly to the method disclosed in Example 1A. During the testing period, the humidity was maintained at 90% and the temperature was maintained at 115° F.

The dough and the tortillas of the test batch that contained the sodium propionate was off color with a light yellow appearance. No off color existed in the dough or the tortillas of the test batch containing the mold inhibitor of this invention. Other characteristics such as odor, flavor, and palatability were comparable.

The tortillas containing sodium propionate molded within 7 days. The tortillas containing the mold inhibitor of this invention molded in 15 days.

Example 3

Tests were run to determine the effectiveness of the disclosed mold inhibitor compound in Neufchatel Cheese (cream cheese). Each sample included 8 ounces of cream cheese. Four different test batches

were prepared. The first was a control with no mold growth inhibiting products added. The remaining 3 batches contained, 0.750%, 0.500%, and 0.250%, respectively of a mold growth inhibiting product of this invention comprised of 0.088% by weight of citric acid, 49.954% by weight calcium propionate, 49.954% by weight potassium sorbate, and .004% by weight of azodicarbonamide.

Except for the control, all samples were heated to 212°F and held at that temperature for five minutes. The samples were then placed on aluminum foil. After cooling, all samples were covered with plastic wrap.

On Day 3 the control began to exhibit mold. On Day 7, the 0.250% sample began to show slight yellowing on the plastic wrap. On Day 17 the test was discontinued and the remaining samples tested. No mold appeared on either sample. Additionally the taste was good and the no offensive odor existed in either sample.

Example 4

Tests were run to determine the effectiveness of a mold growth inhibiting product of this invention in cream cheese that is applied to a pre-formed, refrigerated Danish-style pastry dough.

0.25%, 0.50% and 0.625% respectively of a mold growth inhibiting product of this invention comprised of 0.088% by weight of citric acid, 49.954% by weight calcium propionate, 49.954% by weight potassium sorbate, and .004% by weight of azodicarbonamide, was added to 8 ounces of cream cheese. The cream cheese was then applied to the center of a pre-formed, refrigerated Danish-style pastry dough. The samples were baked at 383°F-392°F, placed on aluminum foil, cooled, and packaged in polyethylene zipper closed bags and held at 32°C. No off-odor or off-taste was noted at the baking stage.

By Day 3, noticeable mold spots were forming on the control cheeses. By Day 6, all of the control rolls were developing molds. The test was terminated after 19 days. Despite heavy mold infestation of the rolls themselves, the cream cheese which contained the mold inhibiting product did not show signs of mold.

Example 5

Two sampled of corn tortillas were prepared. The first sample (TI) was prepared by mixing 2 cups flour, 1 and ½ cup water, and 4.275 g of calcium propionate as the mold inhibiting product. The second sample (T2) was prepared by mixing 2 cups flour, 1 and ½ cup water, and 4.275 g of the mold inhibiting product of this invention which was comprised of 0.004% by weight of azodicarbonamide, 0.004% by weight of citric acid and the remainder being calcium propionate.

For each sample, all ingredients were mixed and 40 gram balls were flattened into approximately 6" round tortillas. The tortillas were each cooked on a hot griddle for approximately three minutes and then allowed to cool.

The pH of the dough and the finished product dissolved in water were taken. Odor and taste tests were also run with 5 being the best and 1 being the worst. The results are recorded below. The first number is the number of persons and the second number is the rating.

TEST	T1 Results	T2 Results
pH Raw	5.60	5.77
pH finished	5.64	5.50
Odor	6/5	6/5
Taste	6/5	6/5
Best Overall	3/1, 3/2	3/1, 3/2

From the results listed above, no difference in taste or odor was initially found and no preference was indicated by the participants of the test.

After sampling and testing was complete, the tortillas were placed in an environment chamber maintained at about 80 to 85 F and monitored daily for signs of mold. After 19 days the test was discontinued. Neither product showed signs of mold but T1 had a distinctive, unpleasant odor while T2 had no unpleasant odor.

Example 6

Five samples of apple walnut muffins were prepared using the following recipe. 127.69 g flour, 39.84 g crisco, 45.45 g sugar, 25.54 g eggs, 3.58 g eggs, 4.26 g baking powder, .72 g cinnamon, 1/10 tsp. nutmeg, 68.44 g milk, 58.26 g shredded peeled apples, and 45.97 g walnut. T1 was the control and included no mold inhibiting agent. T2 included 1.27 g of mold inhibiting product comprised of 0.004% by weight of citric acid, 0.004% azodicarbonamide, and the remainder being calcium propionate. T3 included 1.91 g of mold inhibiting product comprised of 0.004% by weight of citric acid, 0.004% azodicarbonamide, and the remainder being calcium propionate. T4 included 1.27 g of mold inhibiting product comprised of 19.0% by weight of citric acid, 0.004% azodicarbonamide, and the remainder being calcium propionate. T5 included 1.91 g of mold inhibiting product comprised of 19.0% by weight of citric acid, 0.004% azodicarbonamide, and the remainder being calcium propionate.

All five samples were baked for 18 minutes at 375F. Each were cooled and then placed in individual plastic zipper locked bags.

Tests were run on each sample, including the pH of the flour and mold inhibiting product dissolved in water, the pH of a portion of a baked muffin dissolved in water, and the odor and taste of the baked

muffin. The following results were obtained with 5 being the best and 1 being the worst and the first number being the number of people issuing the rating.

Sample	pH Flour	pH muffin	Odor	Taste
T1	7.32	7.02	3/5,1/4,1/3	2/4,1/5,2/3
T2	6.72	6.58	4/5,1/5	4/5,1/5
T3	6.53	6.28	4/5,1/4	4/5,1/4
T4	6.92	6.78	3/5,2/4	3/5,1/3,1/4
T5	7.01	6.85	5/5	3/5,1/4/,1/3

The samples were monitored daily for signs of mold. Signs of mold appeared in three days on T1, five days in T2, six days in T3, 12 days in T4 and 9 days in T5.

Example 7

10 samples (T1-T10) of flour tortillas were prepared by adding the indicated percentage by weight of flour of a mold growth inhibiting product of this invention to 454 g of all purpose flour and mixing with 236.08 g water for each sample. The following formulations of mold growth inhibiting product and percentages were used.

Sample	Percentage	Formulation by Weight%
T1	0.0	Control - no mold growth inhibitor added
T2	1.0	71% Sodium Propionate, 28.996% Citric Acid, and 0.004% Azodicarbonamide
T3	1.0	99.992% Calcium Propionate, 0.004% Citric Acid, and 0.004% Azodicarbonamide
T4	1.0	99.992% Sodium Propionate, 0.004% Zinc Oxide, and 0.004% Azodicarbonamide

T5	1.0	99.992% Calcium Propionate, 0.004% Zinc Oxide, and 0.004% Azodicarbonamide
T6	1.0	64.998% Calcium Propionate, 34.998% Potassium Sorbate, and 0.004% Azodicarbonamide
T7	1.0	80.998% Calcium Propionate, 18.998% Citric Acid, and 0.004% Azodicarbonamide
T8	1.0	80.998% Sodium Propionate, 18.998% Citric Acid, and 0.004% Azodicarbonamide
T9	1.0	80.998% Sodium Propionate, 18.998% Zinc Oxide, and 0.004% Azodicarbonamide
T10	1.0	80.998% Calcium Propionate, 18.998% Zinc Oxide, and 0.004% Azodicarbonamide

For each sample, all ingredients were mixed and 40 gram balls were flattened into approximately 6" round tortillas. The tortillas were each cooked on a hot griddle at 450F to 475F for approximately three minutes and then allowed to cool.

All samples were placed in an environmental chamber maintained at 80F to 85F. Samples were checked daily for mold growth. The test was started on 4/21/95 and 4/24/95. The test was terminated on 5/22/95. The following results were obtained.

Sample	Start Date	Termination Date (When mold appeared)
T1	4/21/95	4/26/95
T2	4/21/95	5/22/95(still mold-free)
T3	4/21/95	5/22/95(still mold-free)
T4	4/21/95	4/29/95
T5	4/21/95	4/30/95
T6	4/24/95	5/10/95

T7	4/24/95	5/10/95
T8	4/24/95	5/22/95(still mold-free)
T9	4/24/95	5/4/95
T10	4/24/95	5/5/95

Taste tests were also completed after the products were grilled. The following results were obtained.

Sample	Taste Test Findings
T1	No odor, good taste
T2	Slight smell, good taste
T3	No odor, good taste
T4	No odor, good taste
T5	No odor, good taste
T6	No odor, good taste
T7	No odor, good taste
T8	No odor, good taste
T9	No odor, good taste
T10	No odor, good taste

On samples T1 through T5, the preferred sample was either T1, T2, or T3, no one being able to differentiate one from the other. On samples T6 through T10, no one could differentiate between the samples.

Example 9

Testing was performed on prior art mold inhibitors and samples of the mold growth inhibiting products of this invention to determine pH, color, odor, and taste of the various products.

A pre-pH test was run on each sample by mixing 5 grams of sample with 45 grams of water. The pre-pH test results are listed below.

For the remaining tests, each sample mixture consisted of 45 grams of mold inhibiting product and 30 grams of water. Each sample

was dried in a 380F oven for 20 minutes and then allowed to dry completely in a 250F oven for up to 10 minutes longer. The color, odor and taste of each treated sample was then recorded. Post pH was also taken of the treated sample by adding 5 grams of the treated sample with 45 grams water.

The samples were comprised of the following ingredients in weight percent, T1 - 100% Potassium Sorbate; T2 - 100% Sodium Propionate; T3 - 100% Calcium Propionate; T4 - 100% Citric Acid; T5 - 99.992% Potassium Sorbate, 0.004% Citric Acid and 0.004% Azodicarbonamide; T6 - 99.992% Potassium Sorbate, 0.004% Zinc Oxide and 0.004% Azodicarbonamide; T7 - 99.992% Potassium Propionate, 0.004% Citric Acid and 0.004% Azodicarbonamide; T8 - 99.992% Potassium Propionate, 0.004% Zinc Oxide and 0.004% Azodicarbonamide; T9 - 99.992% Calcium Propionate, 0.004% Citric Acid and 0.004% Azodicarbonamide; T10 - 99.992% Calcium Propionate, 0.004% Zinc Oxide and 0.004% Azodicarbonamide; T11 - 99.992% Citric Acid, 0.004% Zinc Oxide and 0.004% Azodicarbonamide; and T12 - 99.996% Citric Acid and 0.004%. Azodicarbonamide.

The following results were recorded.

#	Pre-pH	Post-pH	Color	Odor	Taste
T1	9.12	9.56	Off-White	Slight	Slightly Bitter
T2	7.92	9.56	Off-White	Slight	Slightly Bitter
T3	8.01	8.97	Off-White	Slight	Slightly Bitter
T4	1.90	1.86	Orange	Slight	Bitter
T5	7.41	8.68	Light Cream (Lighter than control)	None	None
T6	7.41	8.89	Light Cream (Lighter than control)	None	None
T7	7.19	8.76	White	None	None
T8	7.68	8.56	White	None	None

T9	7.48	7.28	White	None	None
T10	7.45	7.39	White	None	None
T11	1.68	1.46	Clear	None	Not as Tangy
T12	1.80	1.44	Clear	None	Not as Tangy

Example 10

Field tests were designed to determine the effectiveness of the mold growth inhibitors of this invention on all aspects of cheese manufacture, maturation, functionality and flavor.

The protocol was designed with Vat 1 being the Control, ie. no mold growth inhibitor added, Vat 2 including 0.25 percent by weight of total raw ingredients for preparing the cheese product being a mold growth inhibitor of this invention, and Vat 3 including 0.50 percent by weight of total raw ingredients for preparing the cheese product being a mold growth inhibitor of this invention. The mold growth inhibitor was comprised of 49.991% by weight calcium propionate, 49.991% by weight potassium sorbate, 0.004% by weight citric acid, and 0.004% by weight azodicarbonamide.

Figure 1 illustrates the parameters used in preparing the mozzarella cheese. Figure 2 illustrates the parameters used in preparing the cheddar cheese. The mold growth inhibitor was listed as Substance X and was added two minutes after vatting.

After manufacture, the cheese samples were cut into blocks approximately 1 kg (2.2 lb) to simplify subsequent sampling. The mozzarella blocks were stored at -2C and the cheddar blocks were stored at 10C.

At 48 hours post manufacture the chemical composition of the cheese products were evaluated. These results are shown in Figure 5.

Also at 48 hours post manufacture the microbial composition of the cheese products were evaluated. These results are shown in Figure 6.

Immediately after the block samples were prepared, 2 x 100 gram samples were shredded from the block samples and placed in zip-lock bags at 25C and 4C. Each sample was examined visually each day for mold growth. The results of the 25C test are recorded in Figure 3. As shown, after 30 days, no mold was present on either the cheddar sample containing the mold growth inhibitor of this invention.

Partial results of the 4C test are shown in Figure 4. At 19 days into the 30 day test, the mozzarella sample containing 0.5% of the mold growth inhibiting product of this invention and both the cheddar samples were mold free.

Immediately after the samples were prepared, the samples containing the mold growth inhibitor of this invention were evaluated and given points for flavor, background, bitterness, etc. From a possible 105 points, the mozzarella samples containing the mold growth inhibitor of this invention were awarded 92 points giving an 88% rating. From a possible 72 points, the cheddar was awarded 67 points for a 93% rating.

While this invention has been described in relation to the preferred embodiment, it is to be understood that various modifications thereof will now be apparent to one skilled in the art upon reading this specification, and it is intended to cover such modifications which fall within the scope of the following claims.

C L A I M S

What is claimed and desired to be secured by Letters Patent is as follows:

1. A mold growth inhibiting product for food stuffs, comprising a mixture of:

a) a first compound, wherein said first compound is azodicarbonamide; and

b) a second compound, wherein said second compound is citric acid, lactic acid, fumaric acid, potassium sorbate, sodium sorbate, calcium sorbate, sorbic acid, salts of sorbic acid, calcium propionate, potassium propionate, sodium propionate, propionic acid, salts of propionic acid or mixtures thereof.

2. The mold growth inhibiting product of Claim 1, wherein said second compound is potassium sorbate, calcium propionate, sodium propionate or mixtures thereof.

3. The mold growth inhibiting product of Claim 2, comprising

a) about 0.001 to about 5.0 percent by total weight of said mold growth inhibiting product of said first compound; and

b) about 95.0 to about 99.999 percent by total weight of said mold growth inhibiting product of said second compound.

4. The mold growth inhibiting product of Claim 1, wherein

a) said second compound is lactic acid, fumaric acid, potassium sorbate, sodium sorbate, calcium sorbate, sorbic acid, salts of sorbic acid, calcium propionate, potassium propionate, sodium propionate, propionic acid, salts of propionic acid or mixtures thereof; and

b) further comprising a third compound for lowering the decomposition temperature of said first compound.

5. The compound of Claim 4, wherein said third compound is a metal oxide, metal salt, organometallic complex, citric acid, calcium sulfate, triethanol amine or mixtures thereof.

6. The compound of Claim 5, wherein

a) said second compound is potassium sorbate, sodium propionate, calcium propionate or mixtures thereof; and

b) said third compound is citric acid, zinc oxide, or mixtures thereof.

7. The compound of Claim 4, comprising

a) about .001 to about 5.0 percent by total weight of said mold growth inhibiting product of said first compound;

b) about 65.0 to about 99.995 percent by total weight of said mold growth inhibiting product of said second compound; and

c) about .004 to about 30.0 percent by total weight of said mold growth inhibiting product of said third compound.

8. A mold growth inhibiting product for food stuffs, comprising a mixture of:

a) about 1 part by weight of dry mixture, wherein said dry mixture is comprised of:

i) about .001 to about 5.0 percent by total weight of said dry mixture of a first compound, wherein said first compound is azodicarbonamide; and

ii) about 95.0 to about 99.999 percent by total weight of said dry mixture of a second compound, wherein said second compound is acetic acid, lactic acid, fumaric acid, potassium sorbate, sodium sorbate, calcium sorbate, sorbic acid, salts of sorbic acid, calcium propionate, potassium propionate, sodium propionate, propionic acid, salts of propionic acid or mixtures thereof; and

b) about 4 to 8 parts by weight of water.

9. The mold growth inhibiting product of Claim 8, comprising

a) about 65.0 to about 99.995 percent by total weight of said dry mixture of said second compound, wherein said second compound is lactic acid, fumaric acid, potassium sorbate, sodium sorbate, calcium sorbate, sorbic acid, salts of sorbic acid, calcium propionate, potassium propionate, sodium propionate, propionic acid, salts of propionic acid or mixtures thereof; and

b) about .004 to about 30.0 percent by total weight of said dry mixture of a third compound, wherein said third compound lowers the decomposition temperature of said first compound.

10. The mold inhibiting product of Claim 9 wherein said third compound is a metal oxide, metal salt, organometallic complex, citric acid, calcium sulfate, triethanol amine or mixtures thereof.

11. The mold inhibiting product of Claim 10, wherein

a) said second compound is potassium sorbate, sodium propionate, calcium propionate or mixtures thereof; and

b) said third compound is citric acid, zinc oxide, or mixtures thereof.

12. A method of inhibiting mold growth in food stuff, comprising:

a) creating said food stuff by mixing the raw ingredients for preparing said food stuff with a mold inhibiting product, said mold inhibiting product comprising:

i) a first compound, wherein said first compound is azodicarbonamide; and

ii) a second compound, wherein said second compound is citric acid, lactic acid, fumaric acid, potassium sorbate, sodium sorbate, calcium sorbate, sorbic acid, salts of sorbic acid, calcium propionate, potassium propionate, sodium propionate, propionic acid, salts of propionic acid or mixtures thereof; and

b) exposing said food stuff to a sufficient temperature for a sufficient time to activate said first compound such that said food stuff does not impart an off odor, off flavor or off texture due to the inclusion of said second compound.

13. The method of Claim 12, wherein

a) said second compound is potassium sorbate, calcium propionate, sodium propionate or mixtures thereof;

b) said temperature is above about 212°F; and

c) said mold inhibiting product is present in the amount of about 0.01 to about 20.0 percent by total weight of said raw ingredients for preparing said food stuff.

14. The method of Claim 12, wherein

a) said second compound is lactic acid, fumaric acid, potassium sorbate, sodium sorbate, calcium sorbate, sorbic acid, salts of sorbic acid, calcium propionate, potassium propionate, sodium propionate, propionic acid, salts of propionic acid or mixtures thereof; and

b) said dry mixture further comprises a third compound for lowering the decomposition temperature of said first compound.

15. The method of Claim 14, wherein

a) said second compound is potassium sorbate, calcium propionate, sodium propionate or mixtures thereof;

b) said third compound is a metal oxide, metal salt, organometallic complex, citric acid, calcium sulfate, triethanol amine or mixtures thereof;

c) said temperature is above about 140°F; and

d) said mold inhibiting product is present in the amount of about 0.01 to about 20.0 percent by total weight of said raw ingredients for preparing said food stuff.

16. A method of inhibiting mold growth in food stuff, comprising:

a) preparing a mold growth inhibiting product, said mold growth inhibiting product comprising:

i) a first compound wherein said first compound is azodicarbonamide;

ii) a second compound wherein said second compound is citric acid, lactic acid, fumaric acid, potassium sorbate, sodium sorbate, calcium sorbate, sorbic acid, salts of sorbic acid, calcium propionate, potassium propionate, sodium propionate, propionic acid, salts of propionic acid or mixtures thereof;

b) heating said mold growth inhibiting product for a sufficient time and temperature to eliminate a substantial portion of the off odor and taste generally imparted by said second compound; and

c) mixing said mold growth inhibiting product with the ingredients used in preparing said food stuff.

17. The method of Claim 16, wherein

a) said temperature is about 212°F to about 475°F;

b) said time is about 20 to about 30 minutes; and

c) said mold inhibiting product is present in the amount of about 0.01 to about 20.0 percent by total weight of said ingredients used in preparing said food stuff.

18. The method of Claim 16, wherein

a) said second compound is lactic acid, fumaric acid, potassium sorbate, sodium sorbate, calcium sorbate, sorbic acid, salts of sorbic acid, calcium propionate, potassium propionate, sodium propionate, propionic acid, salts of propionic acid or mixtures thereof; and

b) said mold growth inhibiting product further comprises a third compound wherein said third compound is a metal oxide, metal salt, organometallic complex, citric acid, calcium sulfate, triethanol amine or mixtures thereof.

19. The method of Claim 18, wherein

a) said second compound is potassium sorbate, calcium propionate, sodium propionate or mixtures thereof; and

b) said third compound is zinc oxide, citric acid or mixtures thereof.

c) said temperature is above about 140°F;

d) said time is about 6 to about 10 minutes; and

e) said mold inhibiting product is present in the amount of about 0.01 to about 20.0 percent by total weight of said ingredients used in making said food stuff.

20. A method of preparing a mold growth inhibiting product comprising:

a) mixing about 1 part by weight of a dry mixture with about 4 to 8 parts by weight of water to form a first product; wherein said dry mixture is comprised of:

i) a first compound present in the amount of about .001 to about 5.0 percent by total weight of said dry mixture, wherein said first compound is azodicarbonamide; and

ii) a second compound present in the amount of about 95.0 to about 99.999 percent by total weight of said dry mixture, wherein said second compound is citric acid, lactic acid, fumaric acid, potassium sorbate, sodium sorbate, calcium sorbate, sorbic acid, salts of sorbic acid, calcium propionate, potassium propionate, sodium propionate, propionic acid, salts of propionic acid or mixtures thereof; and

b) boiling said first product for about 15 minutes to form a second product;

c) cooling said second product to about room temperature;

d) filtering said second product; and

e) adding an amount of water equivalent to the volume of liquid lost while said first product was boiled to form said mold inhibiting product.

21 The method of Claim 20, wherein said dry mixture comprises

a) about 65.0 to about 99.995 percent of said second compound, wherein said second compound is lactic acid, fumaric acid, potassium sorbate, sodium sorbate, calcium sorbate, sorbic acid, salts of sorbic acid, calcium propionate, potassium propionate, sodium propionate, propionic acid, salts of propionic acid or mixtures thereof; and

b) a third compound present in the amount of about 0.004 to about 30.0 percent by total weight of said dry mixture, wherein said third compound is a metal oxide, metal salt, organometallic complex, citric acid, calcium sulfate, triethanol amine or mixtures thereof.

	Vat 1 Control	Vat 2 .25%	Vat 3 .50%
P/F Ratio	1.7	1.7	1.7
Pasteurization temp (°C)	Standard	Standard	Standard
Temp milk to vat (°C)	34.5	34.5	34.5
Starter type	Mesophiles	Mesophiles	Mesophiles
Starter ratio	1:1:1	1:1:1	1:1:1
Starter %	4	4	4
Prime to pH	6.35	6.35	6.35
Rennet type	Calf	Calf	Calf
ml Rennet/100 liters milk	7	7	7
Setting time (min)	-25	-25	-25
Cook temp (°C)	39.5	39.5	39.5
Drain pH	5.90	5.90	5.90
Salt added to C/S Water	1.25 kg	1.2 kg	1.2 kg
Salting rate-curd	170g/100/milk	170g/100/milk	170g/100/milk
Substance X	0	Container A*	Container B*
Mellowing time (min)	15	15	15
Stretching temp (°C)	65	65	65
Packed in	10 kg bags	10 kg bags	10 kg bags
Cooling water (°C)	5 - 10	5 - 10	5 - 10

*Container A contains 0.25%; Container B contains 0.50%

FIG. 1

	Vat 1 Control	Vat 2 .25%	Vat 3 .50%
P/F Ratio	0.8	0.8	0.8
Pasteurization temp (°C)	Standard	Standard	Standard
Temp milk to vat (°C)	32	32	32
Starter type	Mesophiles	Mesophiles	Mesophiles
Starter ratio	1:1:1	1:1:1	1:1:1
Starter %	1.4	1.4	1.4
Rennet type	Calf	Calf	Calf
ml Rennet/100 liters milk	16	16	16
Setting time (min)	-30	-30	-30
Cook temp (°C)	38	38	38
Drain pH	6.20	6.20	6.20
Salt added to C/S Water	1.25 kg	1.2 kg	1.2 kg
Salting rate-curd	270g/100/milk	270g/100/milk	270g/100/milk
Substance X	0	Container A*	Container B*
Pressing	Normal	Normal	Normal
Packed in	20 kg bags	20 kg bags	20 kg bags
Storage temp (°C)	10	10	10

*Container A contains 0.25%; Container B contains 0.50%.

FIG. 2

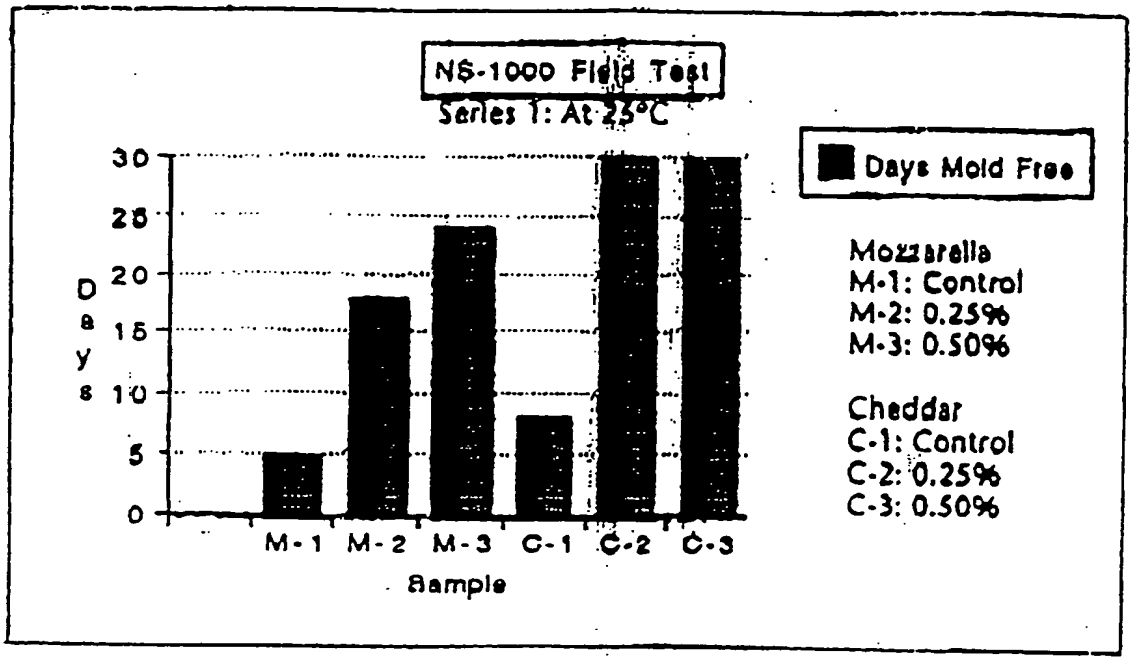

FIG. 3

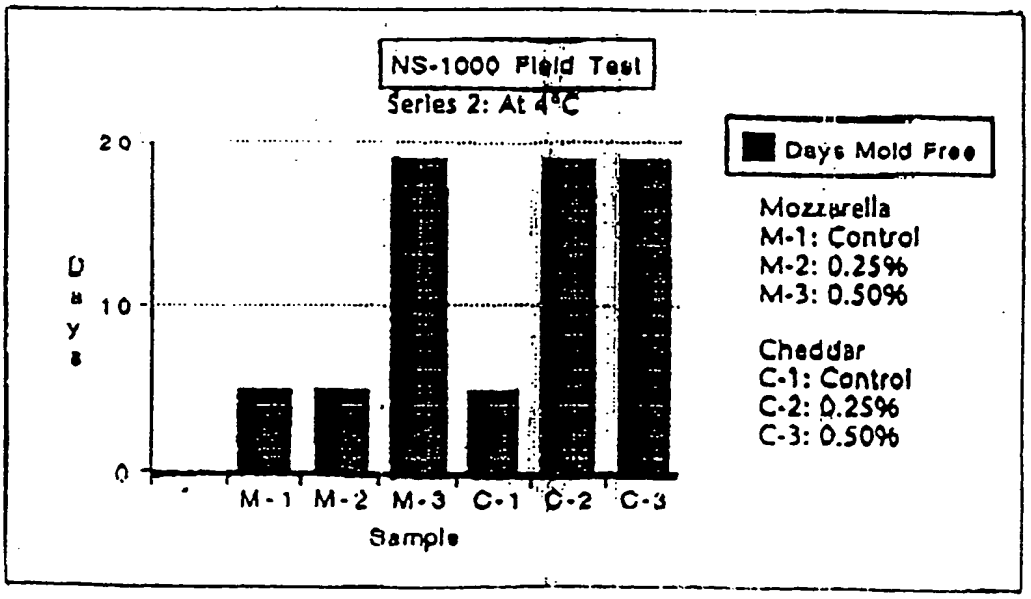

FIG. 4

Test SSU	C02003 Fat %	C03003 Moisture %	C07000 pH	C08000 Salt %
3/14/95 Mozzarella				
Vat 1 (Control)	20.0	47.1	5.44	1.48
Vat 2 (.25%)	19.5	47.4	5.41	1.50
Vat 3 (.50%)	19.5	48.2	5.42	1.49
3/15/95 Cheddar				
Vat 1 (Control)	34.5	36.3	5.11	1.75
Vat 2 (.25%)	34.5	36.2	5.24	1.75
Vat 3 (.50%)	34.0	35.8	5.34	1.88

FIG. 5

SAMPLE						COAG	POS	JAP THD	APC
	Phos-phate	Coliform	E. Coli	Yeast & Mold	NSLAB	Staph	c/u/g	1g	1g
Cheddar									
Vat 1 - Control	P	<10	neg	<10	1600	0,0,0	<10		
Vat 2 - 0.25%	P	<10	neg	<10	2000	2,2,0	40		
Vat 3 - 0.50%	P	<10	neg	<10	340	2,1,0	30		
Mozzarella									
Vat 1 - Control	P	<10	neg	<10	<10	neg	neg	380	2600
						0,0,0	<10		
Vat 2 - 0.25%	P	<10	neg	<10	30	neg	<10	160	1200
						0,0,0			
Vat 3 - 0.50%	P	<10	neg	<10	<10	neg	<10	300	1200
						0,0,0			

FIG. 6

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 96/09783

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A23L3/3526 A23L3/3508 A21D2/24 A21D2/14 A21D8/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A23L A21D A23C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A,3 900 570 (EDWARD A. STIGLER) 19 August 1975 cited in the application see column 2, line 57 - column 3, line 17 see column 3, line 57 - column 6, line 23 see examples 5,6 see claims 1,2,7,8,13-15 ---	1-5, 12-15
X	GB,A,2 264 429 (ELF ATOCHEM NORTH AMERICA INCORPORATION) 1 September 1993 see page 7, line 9 - page 9, line 3 see page 10, line 7 - line 17 see page 12, line 1 - page 14, line 26 see claims 1,4,6-9 --- -/--	1-15

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
26 September 1996	09. 10. 96

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	Dekeirel, M

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A,5 318 785 (VINCENT DESTEFANIS) 7 June 1994 see column 4, line 59 - column 5, line 13 see example 1 see claims 1,3,7,12	1-3,12, 13
X	US,A,4 642 237 (VINCENT A. DE STEFANIS ET AL.) 10 February 1987 see column 3, line 6 - line 11 see examples 4-6	1-4, 12-14
X	GB,A,1 360 145 (PENNWALT CORPORATION) 17 July 1974 see page 1, line 84 - page 2, line 5 see examples 8,9 see claims 1-11	1-5, 12-15
A	CEREAL CHEMISTRY, vol. 69, no. 6, 1992, MINNEAPOLIS US, pages 587-591, XP002014357 C.E. LANG ET AL.: "Effects of additives on flour-water dough mixograms" see page 587, column 1, paragraph 1 - page 589, column 2, last paragraph see page 591, column 1, paragraph 1 - column 2, paragraph 1	1-4,8,9, 12-14
A	GB,A,1 151 985 (MAPLE LEAF MILLS LIMITED) 14 May 1969 see example 3 see claims 1,7,8,11-13	1
A	GB,A,1 545 320 (PENNWALT CORPORATION) 10 May 1979 see claims 1,4-6,12	1
A	GB,A,804 617 (WALLACE & TIERNAN INCORPORATED) 19 November 1958 see page 3, line 115 - page 4, line 43 see page 4, line 68 - page 7, line 35 see page 8, line 7 - line 103 see examples I-VI see claims 1,7,8,11-13	1
A	GB,A,1 404 910 (PEROXIDE CATALYSTS LIMITED) 3 September 1975 see the whole document	1
A	US,A,4 416 904 (EDWARD L. SHANNON) 22 November 1983 cited in the application see column 3, line 4 - column 5, line 24 see column 9, line 30 - column 15, line 51 see claims 1-7	1

1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/US 96/09783

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
US-A-3900570	19-08-75	NONE		
GB-A-2264429	01-09-93	CA-A-	2079839	29-08-93
US-A-5318785	07-06-94	NONE		
US-A-4642237	10-02-87	NONE		
GB-A-1360145	17-07-74	US-A-	3840668	08-10-74
		AR-A-	194271	29-06-73
		AU-B-	469997	26-02-76
		AU-A-	4588972	28-02-74
		CA-A-	938831	25-12-73
GB-A-1151985	14-05-69	CA-A-	851133	08-09-70
		US-A-	3594180	20-07-71
GB-A-1545320	10-05-79	NONE		
GB-A-804617		NONE		
GB-A-1404910	03-09-75	NONE		
US-A-4416904	22-11-83	NONE		

TENT COOPERATION TREATY

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PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
98344PCT		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP99/00370	22/01/1999	23/01/1998
International Patent Classification (IPC) or national classification and IPC A23L1/06		
Applicant PRE GEL S.P.A. et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 4 sheets, including this cover sheet.

   ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
23/03/1999	19.04.2000
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Rinno, U Telephone No. +49 89 2399 8651

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP99/00370

I. Basis of the report

1. This report has been drawn on the basis of (*substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments.*):

Description, pages:

1-12 as originally filed

Claims, No.:

1-19 with telefax of 28/03/2000

2. The amendments have resulted in the cancellation of:

☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

3. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

4. Additional observations, if necessary:

III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application.

☒ claims Nos. 1,5,11,13.

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):

☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):

☒ the claims, or said claims Nos. 1,5,11,13 are so inadequately supported by the description that no meaningful opinion could be formed.

☐ no international search report has been established for the said claims Nos. .

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	19
	No:	Claims	1-18
Inventive step (IS)	Yes:	Claims	
	No:	Claims	1-19
Industrial applicability (IA)	Yes:	Claims	1-19
	No:	Claims	

2. Citations and explanations

see separate sheet

Re It m I

Basis of the report

The amendments filed with the International Bureau under Article 19(1) introduce subject-matter which extends beyond the content of the application as filed, contrary to Article 19(2) PCT. The amendments concerned are the following:

1. Claim 1 "a sweetening agent": The application as filed does not mention sweetening agents in combination with the other features of claim 1. A "sweetener" is just mentioned in the originally filed claims 19 and 20, but only in combination with defined amounts of the other ingredients. Only sugar is described as ingredient together with the other components. Thus the amendments introduces a generalisation and introduces subject-matter not originally filed (Article 34(2)b)PCT).
2. The same argumentation is true for claims 5,11 and 13.

Re Item V

Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability

The application does not fulfill the requirements of novelty set forth in Article 33(2)PCT. Novelty of claims 2,3,4 to 6 to 10 is anticipated by example 3 in document US-A-4387109. Example 3 in US-A-4387109 refers to an apple donut filling comprising water, starch (thickening agent), potassium sorbate (preservative agent), ascorbic acid (antioxidant agent) and citric acid solution (acidifying agent).

Since a "confection unit" is nothing else than a composition or a mixture, the filling in example 3 (US-A-4387109) is also suitable as a "confection unit" and therefore destroys novelty of claims 12 and 14 to 18.

The wording of claim 19 is directed to the preparation of products comprising fruit salad. Since none of the prior art documents cited in the International Search Report teaches about such products, the subject-matter of claim 19 is considered as new in the sense of Article 33(2)PCT over these documents. However, it is common technical knowledge (and such product are on the market for a long time) to add e.g. ascorbic acid to fruit salads or to thicken and stabilize the fruit sauce using a stabilizing and thickening agent (e.g. starch, gelatine or carrageenin). Consequently the subject-matter of claim 19 does not involve an inventive activity as required by Article 33(3)PCT.

The subject-matter of claims 1-19 meets the requirements of Article 33(4) PCT because it is applicable in food industry.

CLAIMS

1. Compound for food products containing at least one of the following agents: antioxidant agent; preservative agent; acidifying agent; stabilising and thickening agent.

2. Compound according to claim 1, wherein said antioxidant is selected from a group comprising ascorbic acid, salts and derivatives thereof, gallates, butylated hydroxyanisole, butilated hydroxytoluene, tocopherols.

3. Compound according to claim 1, or 2, wherein said preservative agent is selected from a group comprising sorbic acid and its salts, propionic acid and its salts, benzoic acid and its salts, hydroxybenzoates.

4. Compound according to ~~any preceding~~ 1 or 3 claim, wherein said acidifying agent is selected from a group comprising citric acid, tartaric acid, metatartaric acid, malic acid.

5. Compound according to any preceding 1 or 3 claim, wherein said stabilising and thickening agent is selected from a group comprising starch, gelatines, alginic acid and its salts, guar gum and other gums, agar-agar, carrageenin, meal of carob seeds, pectins, cellulose and its derivatives, xantan gum.

6. Compound according to claim 1, ~~or 5,~~ wherein said stabilizing and thickening agent may be activated at room temperature.

7. Compound according to claim 1, ~~or 5,~~ wherein said stabilising and thickening agent may be activated at warm condition.

8. Compound according to ~~any~~ 1 or 3 or 6 or 7 ~~preceeding~~ claim, wherein at least some of said agents are in the form of powder.

REPLACE BY PAGE 34

14 1,3,6 a 7

9. Compound according to ~~any~~ of preceding claims and having a consistency of a flowable paste.

10. Compound according to any ~~preceding~~ claim, wherein said agents are present in the following percentages

- antioxidant agent	0 - 5
- preservative agent	0 - 3
- acidifying agent	0 - 10
- stabilising and thickening agent	0 - 80
- sugar	qs

11. Compound according to any ~~of~~ claims 1 to 9, wherein said agents are present in the following percentages

- antioxidant agent	0 - 10
- preservative agent	0 - 10
- acidifying agent	0 - 30
- stabilising and thickening agent	0 - 80
- sugar	qs

12. Compound according to any ~~of preceding~~ claims and further comprising water.

13. Compound according to any ~~of~~ claims 1 to 9, or ~~12~~, wherein, said agents are present in the following percentages:

- antioxidant agent	0 - 4
- preservative agent	0 - 10
- acidifying agent	0 - 30
- stabilising and thickening agent	0 - 80
- sweetener, water	qs

14. Food product comprising a compound according to any preceding claim, and further comprising parts of natural food product.

15. Food product according to claim 14, wherein said natural food product comprises fruit.

16. Food Product according to claim 15, wherein said fruit is candied fruit.

17. Food product according to claim 12, wherein said fruit is in the form of fruit-juice, or puree of fruit.

18. Food product according to any of claims 14 to 17, wherein said agents are present in the following percentages

- antioxidant agent	0 - 2
- preservative agent	0 - 1,2
- acidifying agent	0 - 4
- stabilising and thickening agent	0 - 32.

19. Food product according to any of claims 14 to 17, wherein said agents are present in the following percentages

- antioxidant agent	0 - 4
- preservative agent	0 - 4
- acidifying agent	0 - 12
- stabilising and thickening agent	0 - 32
- sweetener	qs

20. Food product according to any of claims 14 to 17, wherein said agents are present in the following percentages

- antioxidant agent	0 - 4
- preservative agent	0 - 4
- acidifying agent	0 - 12
- stabilising and thickening agent	0 - 32
- sweetener, water, fruit	qs

21. A combination of a food product according to any of claims 14 to 20 and a confectionery product.

22. A combination of a food product according to any of claims 14 to 20 and an ice-cream product.

23. Method for using a compound for flowable food products, characterised in that it comprises mixing with water a compound containing at least one agent selected from a group comprising: antioxidant agent; preservative agent; acidifying agent; stabilising and thickening agent, and subsequently adding parts of a natural food product.

24. Method for using a compound for flowable food products characterised in that it comprises mixing parts of a food product with at least one agent selected from a group comprising: antioxidant agent; preservative agent; acidifying agent; stabilising and thickening agent.

25. Method according to claim 24, and further comprising adding water.

26. Method according to any of claims 23 to 25, and further comprising adding sugar.

27. Method according to one of 23 to 26, and further comprising adding parts of fruit.

28. Method according to claim 27, and further comprising partially candying said parts of fruit.